

Cumulative proportions of educational need units
Ranked by district wealth

Figure 2.--District wealth disparities

In Figure 2, district wealth is placed on the vertical axis. The number of educational need units is placed on the horizontal axis and ranked in ascending order by wealth. Thus, the Gini index (G_w) can be viewed as an index for the disparities of district wealth. By the same notion, district revenue can be placed on the vertical axis against educational need units in the horizontal line. The shift of the Lorenz curve demonstrates the effect of the compositions of local revenue and property tax rate. Holding other things constant, except tax rate, the shift of the Lorenz curve can be viewed as a result of variation of tax rate among the school districts. When state aid is added to district revenue, the downward or upward movement can be viewed as the effect of the state aid distribution. Continuing this adding process, various effects can be shown in Figure 3.

Figure 3 indicates the tax variation effect (or district revenue component effect) and state aid distribution effect. With respect to the tax variation effect, holding other things constant, the shift of the Lorenz curve toward the 45 degree line may indicate the higher effort exerted in the poorer school districts and conversely the lesser tax

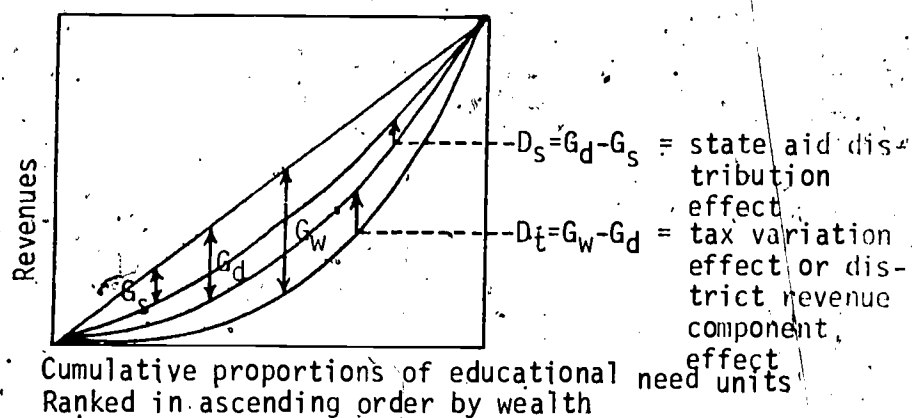


Figure 3.--Tax variation effect and state aid distribution effect

- G_s : Gini index for the school revenue disparity
- G_d : Gini index for the district revenue disparity
- G_w : Gini index for the district wealth disparity
- D_t : tax variation effect on the reduction of district revenue disparity
- D_s : State aid distribution effect on the reduction of school revenue disparity

effort exerted in the rich school districts. By the same token, if the state aid is allocated inversely in relation to district wealth, the Lorenz curve would be shifted upward toward the straight line. This indicates the effect of state aid distribution on the reduction of school revenue disparity and of dependence of school revenue upon district wealth. Since the purpose of the study was to examine the effect of changing the state aid financing system on school revenue equity, the effect of state aid is the focus of Chapter V.

An alternative measure of fiscal neutrality suggested by Michelson and Feldstein is to use regression analysis. According to Feldstein, the wealth elasticity of school spending can serve as a measure of the degree

of wealth neutrality or non-neutrality that has been achieved.⁴ In Feldstein's regression, the log-linear relationship between school spending per educational need unit and wealth per educational need unit was applied. The relation can be written as follows:

$$\text{Log } E_i = a + b \text{ Log } W_i + u_i \quad \text{where:}$$

a = an intercept

u_i = a residual that is orthogonal to $\text{Log } W_i$

The parameter b measures wealth neutrality; complete wealth (or fiscal) neutrality requires $b = 0$. The large value of wealth elasticity b may indicate the heavy dependence of school revenue on district wealth. In applying Feldstein's regression to the parallel regression analysis used in Miner's social and economic factors study⁵ and further recommended by Michelson,⁶ the component effect of school revenue can be identified. Graphically, the parallel regression analysis can be expressed as follows:

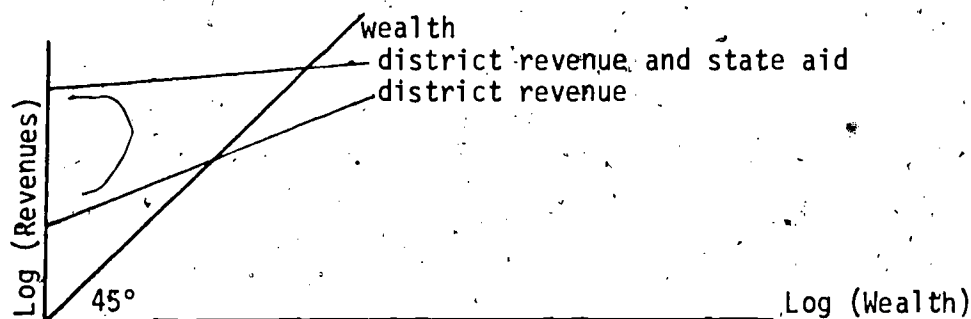


Figure 4. Parallel Regression Analysis

⁴Martin S. Feldstein, "Wealth Neutrality and Local Choice in Public Education," The American Economic Review (March 1975), p. 77.

⁵J. Miner, Social and Economic Factors in Spending for Public Instruction (New York: Syracuse University Press, 1963).

⁶Stephan Michelson, "What is a 'Just' System for Financing Schools? An Evaluation of Alternative Reforms," Law and Contemporary Problems 38 (Winter-Spring 1974):436-458.

In the graph, the logarithmic transformation are applied to both the dependent and the independent variables. The nature of the dependent variables are changed each time. First, wealth per educational need unit is regressed on wealth per educational need unit itself. The regression line is the line with 45 degrees. Secondly, district revenue is regressed on wealth per educational need unit. The wealth elasticity in the district revenue log-regression function may be less than 1.00; it all depends upon the nature of the distribution of district revenue and the factors affecting the distribution. Thirdly, state aid is added to district revenue and regressed on wealth per educational need unit. The wealth elasticity in the state aid and district revenue function may be less than the wealth elasticity in the district revenue function. It, again, depends upon the nature of the state aid distribution. If state aid is allocated to the districts in inverse relation to district wealth, the wealth elasticity in the state aid plus district revenue functions would be less than the elasticity in the district revenue function. The difference between the wealth elasticity in the district revenue function and the wealth elasticity in the state aid and district revenue functions can be viewed as the effect of the state aid distribution.

In summary, two statistical methods were applied in this study to measure the permissible variance. These two methods were (1) coefficient of variation and (2) the McLoone index. The former focuses on the entire distribution of school revenue, while the latter focuses on the distribution below the median. For the criteria of fiscal neutrality, the Gini index and regression analysis were applied to the data. The Gini index measured a concentration of frequency distribution of school revenue in relation to district wealth, while the regression method measured the degree of dependence of school revenue upon district wealth.

CHAPTER V

RESULTS, SUMMARY, CONCLUSIONS, AND FURTHER RESEARCH RECOMMENDATION

This chapter presents a detailed description of the results from statistical analysis which applied the evaluative criteria established in Chapter I to the three years' data for Illinois, Michigan, and Kansas. The statistical results are reported in two sections: (1) Permissible Variance criteria and (2) Fiscal Neutrality criteria. Under each criteria, two statistical analyses were applied to the data, and the results for each statistical analysis will be discussed in turn. Finally, this chapter includes a summary of evaluative statements provided within the limitation of this study and a recommendation for further research. Before presentation of the results, it should be stressed that the 1973 reforms have four year phase-in periods in Illinois and three year phase-in periods in Michigan. The results shown in the following sections are short-run results which contained only the first two years of the reform and may well not be the end result of the reform.

Permissible Variance Criteria

As indicated in Chapter I, two statistical methods were employed under this criteria in computing the variance of school revenue distribution within a state. The first method is "coefficient of variation," which focuses on the entire distribution of school revenue. The second method is the McLoone index which requires a focus not upon the entire distribution but rather upon the distribution below the median school

revenue. The results of these two methods will be examined in the following subsections: (1) coefficient of variation and (2) MoLoone index.

Coefficient of Variation

The results of the coefficient of variation are presented for Illinois, Michigan, and Kansas, respectively.

The Results for Illinois. Table 5 provides the data for the coefficient of variation for the elementary school districts in the State of Illinois.

TABLE 5
PERMISSIBLE VARIANCE CRITERION: COEFFICIENT OF VARIATION
FOR ILLINOIS ELEMENTARY SCHOOL DISTRICTS

	1972-73	1973-74	1974-75
District Wealth	94.9282	95.3301	97.0810
District Revenue	65.3955	64.9081	66.7358
District Revenue and State Aid	29.4404	26.9674	28.2265
State Aid Effect on Equity	54.981%	58.453%	57.704%

It can be seen in Table 5 that the variation of district wealth per TWADA (in Illinois, district wealth is defined in terms of property assessed valuation and TWADA serves as a measure of educational need unit) increased during all three years. This increasing high disparity of district wealth contributed to high district revenue disparities. District local revenue disparity remained at a high level from the beginning to the end of the study. When state aid was added to the district revenue, however, the coefficients of variation in state aid and district (local)

revenues per TWADA decreased from 29.4404 in 1972-73 to 26.9674 in 1973-74, but it increased thereafter. Table 5 shows the state aid distribution effect on the movement toward the goal of narrowing the variation of school revenue per pupil among the school districts within a state, which is defined under the criteria of permissible variance. The "state aid distribution effect" was calculated by subtracting the coefficient of variation for district revenue from the coefficient of variation for the combined district revenue and state aid and dividing the result by the district revenue variation coefficient. The state aid distribution effects were reported in percentages indicating that the percentage of reduction of school revenue variation was due to the inclusion of the state aid distribution factor. The increasing trend shown in Table 5 indicates that state aid was allocated inversely to the poor school districts which lack financial resources in 1973-74 and 1974-75 than in 1972-73. Thus, state aid distribution has a more equalizing effect. The effect of state aid distribution in Illinois elementary school districts appears to be larger again in the first year of the reform than in the second year. It should also be noted that in spite of increasing disparity in local wealth and local revenue, the state aid was able to offset these trends and cause a reduction in state aid plus district revenue variation.

Table 6 provides the data on the coefficient of variation for Illinois high school districts. The coefficient of variation for district wealth per TWADA in Illinois high school districts are approximately half as large as the coefficient of variation in Illinois elementary school

districts. This would be expected since larger geographic units normally show less variation. The district revenue disparity still remains large and has not been reduced. The coefficient of variation for the district revenue and state aid, however, show improvement due to the effect of the state aid distribution. The state aid effect on the movement toward the goal of the reduction of school revenue variations increased from 30.852 percent in 1972-73 to 41.778 percent in 1974-75.

TABLE 6

PERMISSIBLE VARIANCE CRITERION: COEFFICIENT OF VARIATION
FOR ILLINOIS HIGH SCHOOL DISTRICTS

	1972-73	1973-74	1974-75
District Wealth	50.7121	50.4520	50.5981
District Revenue	40.7686	40.6129	41.6655
District Revenue and State Aid	28.1906	25.3338	24.2582
State Aid Effect on Equity	30.852%	37.621%	41.778%

For Illinois unit school districts, the variation per TWADA of district wealth and of district revenue in Table 7 were approximately the same as the variation in the Illinois high school districts, which again would be expected since they are of similar geographic size. No noticeable reduction of variation of either district wealth or district revenues was evident after the reform of the state aid financing system.

The coefficients of variation for the district revenue with state aid were also computed. These coefficients demonstrate a decreasing trend in Table 7. The district revenue plus state aid variation coefficients were slightly reduced (from 14.7044 in 1972-73 to 13.4112

in 1974-75. The "state aid effect" also shows an upward trend in the table. This indicates that a slightly greater effort in equalizing school revenue per TWADA has been made by the new reform of the state aid funding system.

TABLE 7

PERMISSIBLE VARIANCE CRITERION: COEFFICIENT OF VARIATION
FOR ILLINOIS UNIT SCHOOL DISTRICTS

	1972-73	1973-74	1974-75
District Wealth	48.8246	48.3566	48.5209
District Revenue	42.2743	42.2209	42.6614
District Revenue and State Aid	14.7044	13.4378	13.4112
State Aid Effect on Equity	65.216%	68.172%	68.564%

The Results for Michigan. Michigan, unlike Illinois, has only unit school districts. Table 8 presents the coefficient of variation in revenues, the state aid distribution effect, and the grandfather clause effect for the Michigan unified school districts.

Both the coefficient of variation of district wealth per educational need unit and the variation coefficient of district revenue per educational need unit in 1972-73 in Table 8 are approximately equivalent to the coefficients for Illinois elementary school districts. The downward trend is not shown in Illinois elementary school districts in wealth variation and district revenue variation seems to be apparent in Michigan unified school districts. The district revenue variation for Michigan unified school districts declined from 60.0911 in 1972-73 to 53.5129 in 1974-75. Table 8 also indicates that the coefficient of variation

TABLE 8
PERMISSIBLE VARIANCE CRITERION: COEFFICIENT OF VARIATION
FOR MICHIGAN SCHOOL DISTRICTS

	1972-73	1973-74	1974-75
District Wealth	95.2879	84.0871	82.2179
District Revenue	60.0911	56.1271	53.5129
District Revenue and State Aid	27.6828	20.8641	19.7063
District Revenue and State Aid and Grandfather Clause Allocation	Not Available	19.1788	19.5043
State Aid Effect on Equity in Percentage-wise	53.932%	62.827%	63.175%
Grandfather Clause Allocation Effect on Equity	Not Available	3.003%	0.377%

district revenue and state aid per educational need unit was reduced by approximately 8.00 in 1974-75 compared to the 1972-73 coefficient of variation. If adding the additional state aid allocated by the grandfather clause which gave special consideration to the declining property assessed valuation school districts and lower tax rate school districts, then the coefficient of variation in state aid plus district revenue was further reduced to 19.5043 in 1974-75 from 27.6828 in 1972-73. With respect to the state aid effect on the movement of the Michigan financing system toward the goal of the permissible variance, Table 8 shows the impact of this movement in 1974-75. Adding the grandfather clause allocation to the computation, further increases the effect of total state aid distribution on the movement toward the goal of permissible variance. The increasing total state aid effect indicates that a positive effect in reducing the variation of school district revenue per educational need unit was made by the inclusion of the grandfather clause allocation.

The Results for Kansas. The new state aid formula in Kansas was designed to compensate for the presumed diseconomies of scale faced by small school districts. The school districts were sorted into three categories: (1) school districts with under 400 pupils, (2) school districts with between 400 and 1299 pupils, and (3) school districts with 1300 pupils and over. Different norm budgets and adjustment factors were specified by the 1973 Kansas school district equalization act for each enrollment category in computing the local effort rate and allocating state aid. Because of this different treatment for different enrollment categories, the analysis of the data was made for each enrollment category district, and the results are reported in the same fashion.

Table 9 contains the data on the coefficient of variation for the school districts with under 400 pupils. The coefficient of variation in district wealth per educational need unit (district wealth were defined as the total of personal income and adjusted property assessed valuation) remained relatively unchanged between 1972-73 and 1974-75. District revenue disparities increased in the first year of the Kansas reform, but decreased thereafter.

TABLE 9

PERMISSIBLE VARIANCE CRITERION: COEFFICIENT OF VARIATION
FOR KANSAS SCHOOL DISTRICTS (UNDER 400 PUPILS)

	1972-73	1973-74	1974-75
District Wealth	40.704	40.895	39.586
District Revenue	33.067	37.802	35.434
District Revenue and State Aid	24.594	23.586	22.602
State Aid Effect on Equity	25.623%	37.607%	36.213%

The downward trend of the coefficient of variation with regard to district revenue plus state aid are shown in Table 9. The state aid effect in achieving the goal of permissible variance appeared greater in the school years after the reform than in the year before the reform.

The results for Kansas school districts with between 400 and 1299 students are reported in Table 10.

TABLE 10
PERMISSIBLE VARIANCE CRITERION: COEFFICIENT OF VARIATION
FOR KANSAS SCHOOL DISTRICTS (400-1299 PUPILS)

	1972-73	1973-74	1974-75
District Wealth	39.578	39.927	42.493
District Revenue	30.302	46.041	44.208
District Revenue and State Aid	21.263	17.571	16.053
State Aid Effect on Equity	29.829%	61.837%	63.688%

The coefficients of variation in both district wealth per educational need unit and district revenue per educational need unit remained moderately high. The upward trend of the coefficient of variation in district revenue can be seen in Table 10. Disregarding the increase of the coefficient of variation in district revenue, there was a downward trend of the coefficient of variation in the district revenue plus state aid. Kansas made a great effort in reducing the school revenue variations among the school districts with between 400 and 1299 students. This great effort can be observed in the increases of state aid effect on the movement toward the goal of permissible variance.

Table 11 provides the data on the coefficients of variation for the Kansas school districts with enrollments of over 1300 pupils.

TABLE 11

PERMISSIBLE VARIANCE CRITERION: COEFFICIENT OF VARIATION
FOR KANSAS SCHOOL DISTRICTS (1300 AND MORE PUPILS)

	1972-73	1973-74	1974-75
District Wealth	34.562	33.975	35.545
District Revenue	23.580	35.175	35.131
District Revenue and State Aid	13.714	11.239	9.941
State Aid Effect on Equity	41.841%	68.147%	71.704%

Both the coefficients of variation in district wealth and district revenue were slightly lower than the coefficients of variation for school districts with enrollment between 400 and 1299 pupils. However, the district revenue variation seemed to be increasing at a faster rate during the first year of the reform and remained relatively stable in the second year. Similar to the results for school districts with enrollments between 400 and 1300 pupils, the school state plus district revenue variations noticeably decreased from 13.714 in 1972-73 to 9.941 in 1974-75. The state aid allocation also had a greater impact on the movement toward the goal of permissible variance (defined in terms of coefficient of variation) during the reform years than in the year before the reform.

McLoone Index

The second set of three tables, Tables 12 through 14, present McLoone indexes for Illinois, Michigan, and Kansas. The main focus of the McLoone index is on the distribution of school revenue below the median, rather than on the entire distribution of school revenue.

The Results for Illinois. Table 12 provides the data on the McLoone index for all types of school districts in Illinois. There

appears to have been some improvement in the unit and high school districts after the 1973 reform. In the elementary school districts, a downward trend was observed. The McLoone index, 0.89152 in 1972-73, decreased to 0.84688 in 1974-75. This decrease in the McLoone index in Illinois elementary school districts suggests that system reformers and policy makers may wish to pay special attention to the poorest school districts.

TABLE 12

PERMISSIBLE VARIANCE CRITERION: McLOONE INDEX FOR
ILLINOIS SCHOOL DISTRICTS

Year	Unit		High		Elementary	
	McLoone Index	Median	McLoone Index	Median	McLoone Index	Median
1972-73	0.90299	\$798	0.82809	\$928	0.89152	\$764
1973-74	0.91913	\$862	0.84944	\$996	0.87665	\$851
1974-75	0.92161	\$910	0.85903	\$1099	0.84688	\$944

The Results for Michigan. As was the case in Illinois elementary school districts, a downward trend was observed in Michigan unified districts. The McLoone index, 0.92077 in 1972-73, decreased to 0.90646 in 1974-75. This decrease in the McLoone index indicates that no progress was made in the 1973 reform in lifting many poor school districts closer to the target level--the median of school revenue per pupil, and suggests, again, that policy makers may wish to pay special attention to the position of the poorest districts in Michigan.

TABLE 13

PERMISSIBLE VARIANCE CRITERION: McLOONE INDEX FOR
MICHIGAN SCHOOL DISTRICTS

	1972-73	1973-74	1974-75
McLoone Index	0.92077	0.90104	0.90646
Median of School Revenue per Pupil	\$758	\$849	\$936

The Results for Kansas. McLoone indexes for all types of enrollment category school districts in Kansas are presented in Table 14. An upward trend in the McLoone indexes for the second and the third category districts indicate that the McLoone index increased, and that many poor school districts were moved toward the target spending level, e.g., the median expenditure. For the smallest category, districts with enrollments under 400 pupils, the McLoone index was increased in the first year of the reform, but decreased in the second year of the reform. The largest movement toward the target level was found in the second category districts with enrollments between 400 and 1299, followed immediately by the third district category with 1300 and over, and finally by the first category districts of under 400 pupils.

TABLE 14

PERMISSIBLE VARIANCE CRITERION: McLOONE INDEX FOR
KANSAS SCHOOL DISTRICTS

Under 400 Pupils		400-1299 Pupils		1300 & More Pupils	
McLoone Index	Median	McLoone Index	Median	McLoone Index	Median
1972-73 0.86137	\$1193	0.86390	\$834	0.94777	\$694
1973-74 0.88857	\$1173	0.89789	\$863	0.94951	\$755
1974-75 0.87912	\$1315	0.91646	\$963	0.96414	\$856

Fiscal Neutrality Criterion

The criteria of "fiscal neutrality" can be stated as follows: school revenue levels should not be dependent upon the district wealth but rather on the wealth of the state as a whole. In measuring fiscal neutrality, two statistical methods were employed. One method, the Lorenz curve and Gini index, show an empirical distribution of school revenues in a state among the educational need units ranked from poor to rich in terms of district wealth. The other method used was regression analysis, in which the complete neutrality requires wealth elasticity equal to zero. The state aid effect on the movement toward the goal of fiscal neutrality was also examined. When using the Gini index, the state aid effort can be identified as the difference between the Gini index for district revenue and the Gini index for the combined district revenue and state aid in the district revenue and state aid equation. When using the regression analysis, the state aid effect is identified as the difference between wealth elasticity in the district revenue regression equation and wealth elasticity in the district revenue plus state aid equation. The greater the difference (expressed in percentages), the greater the impact of state aid on the movement toward the goal of fiscal neutrality. The results for the criteria of fiscal neutrality are presented in the following two subsections: (1) Gini index and (2) Wealth elasticity.

Gini Index

The third set of seven tables, Tables 15 through 21, provide Gini indexes or coefficients for Illinois, Michigan, and Kansas.

The Results for Illinois. Table 15 contains the Gini indexes for district wealth, district revenue, and the district revenue plus state

aid for Illinois elementary school districts.

TABLE 15

FISCAL NEUTRALITY CRITERION: GINI INDEX FOR ILLINOIS
ELEMENTARY SCHOOL DISTRICTS

	1972-73	1973-74	1974-75
District Wealth	0.2703	0.2665	0.2702
District Revenue	0.2665	0.2646	0.2629
District Revenue and State Aid	0.0995	0.0848	0.0727
State Aid Effect on Equity	62.664%	67.952%	70.392%

Gini indexes for both district wealth and district revenue remained relatively stable in all three years. This indicates that district wealth and district revenue were about as unequal in the second year of the reform as they were during the year before the reform. When adding the state aid to district revenue, the Gini index decreased to 0.0727 in 1974-75 from 0.0995 in 1974-75. This downward movement indicates a greater progress made toward the goal of fiscal neutrality for Illinois elementary school districts. With regard to state aid distribution effect on equity in this downward movement of Gini index, it appeared to be greater in 1973-74 and 1974-75 than in 1972-73. This was shown by the successively smaller positive values for district revenue and state aid Gini indexes relative to district revenue Gini indexes.

For Illinois high school districts, Table 16 shows that district wealth Gini indexes and district revenue Gini indexes were relatively small compared to the Gini indexes of district wealth and of district revenue in elementary school districts. Gini indexes for district revenue and state aid show a steady progress made toward the goal of fiscal

neutrality from 1972-73 to 1974-75. This might have been due to the increasing distributive power of state aid funding reform. The increasing effect of state aid distribution can be seen in Table 16. The effect was 37 percent in 1972-73 and 50 percent in the second year of the reform.

TABLE 16

FISCAL NEUTRALITY CRITERION: GINI INDEX FOR ILLINOIS
HIGH SCHOOL DISTRICTS

	1972-73	1973-74	1974-75
District Wealth	0.1687	0.1683	0.1677
District Revenue	0.1528	0.1540	0.1513
District Revenue and State Aid	0.0961	0.0844	0.0756
State Aid Effect on Equity	37.107%	45.000%	50.033%

Table 17 provides the data on Gini indexes for Illinois unit school districts. It appears that district wealth became more unevenly distributed over the three year period. This indicates that unit school district wealth in Illinois increased in disparity with the passage of time.

TABLE 17

FISCAL NEUTRALITY CRITERION: GINI INDEX FOR ILLINOIS
UNIT SCHOOL DISTRICTS

	1972-73	1973-74	1974-75
District Wealth	0.1154	0.1162	0.1482
District Revenue	0.0885	0.0888	0.1045
District Revenue and State Aid	0.0345	0.0265	0.0143
State Aid Effect on Equity	61.017%	70.157%	86.315%

The increasing values of Gini indexes for district revenue indicates that district revenue disparities seemed to become larger in 1974-75 than in 1972-73. The increasing district revenue disparities might be partly due to the increasing disparities of district wealth. Regardless of the greater district local revenue disparities, a remarkable improvement was made in reducing the disparities of district revenue with state aid and, hence, the state moved closer toward the goal of fiscal neutrality. Clearly the movement toward the goal of fiscal neutrality resulted from the reform.

The Results for Michigan. Table 18 presents the Gini indexes for Michigan unified school districts. Both district wealth Gini indexes and district revenue Gini indexes remained relatively stable over the period from 1972-73 to 1973-74. The value of Gini indexes for district revenue, however, were greater than the value for district wealth. With respect to the state aid effect on the movement toward the goal of fiscal neutrality, Gini indexes in Table 18 show that a significant movement was made toward the goal of fiscal neutrality in all three years. The state aid effect in 1973-74 and 1974-75 was relatively stronger than the state aid effect in 1972-73. With the addition of grandfather clause allocation, state aid effect increased by another half percent toward the goal of fiscal neutrality.

The Results for Kansas. Gini indexes in Table 19 show that the distribution of district wealth was as unequal at the end of the study period as at the beginning for Kansas school districts with pupils under 400. A noticeable change was shown in the distribution of district revenue. A trend toward increasing district revenue disparity did not

TABLE 18

FISCAL NEUTRALITY CRITERION: GINI INDEX FOR MICHIGAN
SCHOOL DISTRICTS

	1972-73	1973-74	1974-75
District Wealth	0.2059	0.2034	0.2046
District Revenue	0.2228	0.2191	0.2192
District Revenue and State Aid	0.0562	0.0465	0.0444
District Revenue and State Aid and Grandfather Clause Allocation	Not Available	0.045	0.0444
State Aid Effect on Equity in Percentage-wise	74.775%	78.777%	79.745%
Grandfather Clause Allocation Effect on Equity	Not Available	0.684%	0.000%

TABLE 19

FISCAL NEUTRALITY CRITERION: GINI INDEX FOR KANSAS
SCHOOL DISTRICTS (UNDER 400 PUPILS)

	1972-73	1973-74	1974-75
District Wealth	0.1997	0.1962	0.1973
District Revenue	0.1407	0.1955	0.1892
District Revenue and State Aid	0.0961	0.0816	0.0835
State Aid Effect on Equity	31.698%	58.261%	55.867%

offset the strong Kansas effort on the movement toward the goal of fiscal neutrality. The magnitude of Gini indexes for district revenue with state aid decreased from 0.0961 in 1972-73 to 0.0835 in 1974-75. The impact of state aid distribution on equity was largely increased from a low level in 1972-73 to a relatively high level in 1974-75.

The results of the Gini index for Kansas school districts (400-1299 enrollment) are presented in Table 20.

TABLE 20

FISCAL NEUTRALITY CRITERION: GINI INDEX FOR
KANSAS SCHOOL DISTRICTS (400-1299 PUPILS)

	1972-73	1973-74	1974-75
District Wealth	0.2033	0.2058	0.2226
District Revenue	0.1454	0.2362	0.2398
District Revenue and State Aid	0.0924	0.0775	0.0711
State Aid Effect on Equity	36.451%	67.188%	70.075%

The changes in district wealth disparity are shown in the above table. District revenue seems to become more unevenly distributed in the reform years than in the year before the reform. In spite of more unevenly distributed district revenue, the movement of the Gini index values over the years of the study show clearly the distributional impact of the reform. The state aid distribution effect on equity in 1974-75 was twice as large in 1972-73. A marked improvement was made toward the goal of fiscal neutrality.

Gini indexes for district wealth in Kansas school districts with pupils 1300 and more, presented in Table 21, indicate only slight change in the distribution of district wealth. Like the results of district disparity in the first and second enrollment category districts, the disparity of district revenue seems to have increased in 1974-75 over 1972-73. In spite of more unequal district (local) revenue distribution, the Gini indexes for district revenue with state aid appeared to be smaller at the end of the study period than at the beginning. A

noticeable state effort was made in reducing large district revenue disparity and hence the state moved toward the goal of fiscal neutrality.

TABLE 21

FISCAL NEUTRALITY CRITERION: GINI INDEX FOR KANSAS
SCHOOL DISTRICTS (1300 AND MORE PUPILS)

	1972-73	1973-74	1974-75
District Wealth	0.1335	0.1326	0.1419
District Revenue	0.0671	0.1217	0.1302
District Revenue and State Aid	0.0330	0.0290	0.0250
State Aid Effect on Equity	50.819%	76.171%	80.798%

Wealth Elasticity

The last set of seven tables, Tables 22 through 28, show wealth elasticities for Illinois, Michigan, and Kansas. Wealth elasticity is measured by the log-linear relationship between revenues per educational need unit and wealth per educational need unit. A complete fiscal neutrality requires wealth elasticity equal to zero.

The Results for Illinois. A logarithmic transformation was applied to the Illinois data on the district revenue equations and the total of district revenue with state aid equations. In district wealth regression, wealth elasticity was fixed and had value of 1.00. The wealth elasticities in the district local revenue function for Illinois elementary districts presented in Table 22 are less than 1.00. This indicates that district local revenue shifted away from fiscal neutrality and were more

dependent upon district wealth. In 1974-75, a one percent increase in district wealth would lead to a 0.9176 percent increase in district revenue. This heavy dependence on district wealth was significantly reduced after the infusion of the state aid distribution.

TABLE 22

FISCAL NEUTRALITY CRITERION: REGRESSION APPROACH FOR
ILLINOIS ELEMENTARY SCHOOL DISTRICTS

	1972-73	1973-74	1974-75
District Wealth	1.00000	1.00000	1.00000
District Revenue	0.90838	0.91657	0.91760
District Revenue and State Aid	0.27679	0.24592	0.23293
State Aid Effect on Equity	69.529%	73.169%	74.615%

In the district revenue plus state aid log-regression equations, the downward sloping indicated that state aid distribution moved the state closer toward the goal of fiscal neutrality.

Wealth elasticities in revenue log-regression equations are presented in Table 23 for Illinois high school districts. The elasticities of district revenue with respect to district wealth are relatively high and increased with the passage of time. The high level of wealth elasticities show great influence of district wealth on per TWADA district revenue.

In Table 23 the wealth elasticities declined when state aid was added into the log-regression equation. Upon comparison among wealth elasticities in the three years under investigation, the trend was downward.

TABLE 23

FISCAL NEUTRALITY CRITERION: REGRESSION APPROACH FOR
ILLINOIS HIGH SCHOOL DISTRICTS

	1972-73	1973-74	1974-75
District wealth	1.00000	1.00000	1.00000
District Revenue	0.82471	0.85144	0.86096
District Revenue and State Aid	0.44843	0.39949	0.34834
State Aid Effect on Equity	45.625%	53.081%	59.541%

The variation of wealth elasticity between 1972-73 and 1974-75 was near 0.10 (decrease about 23 percent). Such large variation between wealth elasticities clearly demonstrate the distributive power of state aid in the reform years. The state aid effect on the movement toward the goal for Illinois high schools was increased from 45.625 percent in 1972-73 to 59.541 percent in 1974-75.

Table 24 provides the data on wealth elasticities for Illinois unit school districts.

TABLE 24

FISCAL NEUTRALITY CRITERION: REGRESSION APPROACH FOR
ILLINOIS UNIT SCHOOL DISTRICTS

	1972-73	1973-74	1974-75
District Wealth	1.00000	1.00000	1.00000
District Revenue	0.94341	0.89965	0.90780
District Revenue and State Aid	0.21693	0.17640	0.13478
State Aid Effect on Equity	77.006%	80.392%	85.153%

Similar to the results of wealth elasticities in district revenue functions for Illinois high school districts, the elasticities of district local revenue with respect to district wealth show heavy dependence of district revenue upon district wealth. However, they are decreasing somewhat with the passage of time. With regard to state aid effect, the distributive power of state aid was greater in the reform years than in the year before the reform. The distributive power was 77 percent in 1972-73, and 85 percent in 1974-75. The increasing state aid distributive power indicates the improvement of equity in financing Illinois unit school districts.

The Results for Michigan. Wealth elasticities in district revenue log-regression functions for Michigan school districts presented in Table 25 were as large as wealth elasticities in the district revenue function for Illinois elementary school districts. The elasticities of district revenue plus state aid in Michigan were declining from 0.22613 in 1972-73 to 0.13532 in 1974-75. With the distribution of the grandfather clause allocation, the further reduction of wealth elasticities resulted during the first year of the reform, but not during the second year. The decreasing wealth elasticities were due to the distribution of state aid plus the grandfather clause allocation. This trend demonstrates a marked improvement of the Michigan financing system with respect to reaching the goal of fiscal neutrality.

The Results for Kansas. In Table 26 wealth elasticities for Kansas school districts under 400 pupils are presented. The increasing wealth elasticities in district revenue functions was found in the table. In spite of the noticeable change of wealth elasticities in district local revenue in a negative direction, the state aid distribution in the reform

TABLE 25

FISCAL NEUTRALITY CRITERION: REGRESSION APPROACH FOR
MICHIGAN SCHOOL DISTRICTS

	1972-73	1973-74	1974-75
District Wealth	1.00000	1.00000	1.00000
District Revenue	0.90447	0.87829	0.85880
District Revenue and State Aid	0.22613	0.13995	0.13532
District Revenue and State Aid and Grandfather Clause Allocation	Not Available	0.12951	0.13507
State Aid Effect on Equity	74.990%	84.065%	84.243%
Grandfather Clause Allocation Effect on Equity	Not Available	7.459%	0.124%

TABLE 26

FISCAL NEUTRALITY CRITERION: REGRESSION APPROACH FOR
KANSAS SCHOOL DISTRICTS (UNDER 400 PUPILS)

	1972-73	1973-74	1974-75
District Wealth	1.00000	1.00000	1.00000
District Revenue	0.69873	1.01987	0.97208
District Revenue and State Aid	0.47008	0.42403	0.41440
State Aid Effect on Equity	32.723%	58.423%	55.768%

years reduced the wealth elasticities in district revenue by about 50 per-
cent and also moved further toward the goal of fiscal neutrality.

The upward trend of wealth elasticities in the district local
revenue function for Kansas school districts with between 400 and 1299

pupils are also shown in Table 27. The wealth elasticities in the district local revenue functions in 1973-74 and in 1974-75 exceeded the 1.00 which was indicated in the wealth elasticities for wealth itself. This exceeding of 1.00 may be due to the composition of district revenues or to the change of tax distribution. Further research about the distribution of tax rate and district revenue composition needs to be done. In Table 27 the state aid effect in reducing the heavy dependence upon local resources seems to be apparent. The effect was 36.937 percent in 1972-73 and increased to 70.994 percent in 1974-75.

TABLE 27

FISCAL NEUTRALITY CRITERION: REGRESSION APPROACH FOR
KANSAS SCHOOL DISTRICTS (400-1299 PUPILS)

	1972-73	1973-74	1974-75
District Wealth	1.00000	1.00000	1.00000
District Revenue	0.69852	1.16367	1.08045
District Revenue and State Aid	0.44051	0.37415	0.31339
State Aid Effect on Equity	36.937%	67.847%	70.994%

In Table 28 a similar trend of wealth elasticity in the district revenue function for Kansas school districts of between 400 and 1299 pupils can be observed in district revenue functions for Kansas districts of over 1300. The state aid effect in achieving the goal of fiscal neutrality was pronounced. The wealth elasticities in the equations of district revenue plus state aid were reduced from 0.22731 in 1972-73 to 0.14012 in 1974-75. This large reduction of influence of district revenue on school revenue was apparently due to the greater distributive power of

state aid in the reform years.

TABLE 28

FISCAL NEUTRALITY CRITERION: REGRESSION APPROACH FOR
KANSAS SCHOOL DISTRICTS (1300 AND MORE PUPILS)

	1972-73	1973-74	1974-75
District Wealth	1.00000	1.00000	1.00000
District Revenue	0.41713	0.79460	0.83367
District Revenue and State Aid	0.22731	0.18568	0.14012
State Aid Effect on Equity	45.506%	76.632%	83.192%

Summary

The major purpose of this study has been to investigate the degree to which school revenue equity improved after the adoption of new state aid funding systems in Illinois, Michigan, and Kansas. Equity was defined in terms of two criteria--permissible variance and fiscal neutrality. Permissible variance requires narrowing the variations of school revenue per pupil among school districts to some "permissible" amount, while fiscal neutrality calls for less dependence of school revenue upon district wealth. Two statistical methods were applied to the data under each criteria. The coefficient of variation and the McLoone Index under the permissible variance criteria were used to measure the variance of the entire school revenue distribution and of the school revenue distribution below the median. Under the criteria of fiscal neutrality, the Gini index and regression analysis were used. The Gini index regards the nature of school revenue distribution with respect to district wealth. The lower the Gini index, the less the dependence of

school revenue upon district wealth. In the regression analysis, wealth elasticity was generated from revenue functions with logarithmic transformations. The value of wealth elasticity indicated that the percentage of change in school revenue was due to a one percent change in district wealth. The statistical results from each method under each criteria for Illinois, Michigan, and Kansas presented in the foregoing section are summarized as follows.

1. District wealth disparities measured by both the coefficient of variation and Gini index in Illinois elementary school districts were relatively high when compared with the disparities in Illinois high school districts and unit school districts. The disparities of district wealth in Michigan school districts were as large as the disparities of district wealth in Illinois elementary school districts. However, a slightly decreasing trend of district wealth disparities was apparent in Michigan school districts, but not apparent in Illinois elementary school districts. For Kansas school districts, district wealth disparities in all enrollment categories of school districts were moderately high. There also appeared no clear reduction of district wealth disparities.

2. As part of the results of relatively high levels of district wealth disparities in Illinois elementary school districts and Michigan school districts, the disparities of district local revenues were also at high levels. For the Kansas school districts, district local revenue disparities became even greater in 1973-74 and 1974-75 reform years than in the year 1972-73 which was before the reform.

3. In spite of high levels of district local revenue disparities in school districts in all three states, a substantial reduction in the amount of school revenue disparities existed. The reduction of school

revenue disparities seems to be due to the great distributive effect of state aid.

4. Downward trends of school revenue disparities were observed in all three states. The downward movement over the school years included in the investigation showed clearly the distributional impact of the 1973 school financing reforms in the states of Illinois, Michigan, and Kansas.

5. With regard to fiscal neutrality, the downward movement of Gini indexes for school revenues with respect to district wealth were revealed in all three states, and indicated that there appeared a significant improvement of state funding systems toward the goal of fiscal neutrality.

6. In addition to the measurement of fiscal neutrality by Gini index, regression analyses were employed. Wealth elasticities in district revenue functions were found to be relatively high in Illinois and Michigan school districts, but only moderately high in Kansas school districts. Regardless of the high level of dependence of district revenue upon district wealth, wealth elasticities in district revenue plus state aid functions were substantially reduced. Moreover, the downward movement of wealth elasticities were evident in all three states. There seemed to have been marked improvement in reducing the degree of dependence of school revenue upon district wealth to a substantial extent. This moved Illinois, Michigan, and Kansas toward the goal of fiscal neutrality.

General Conclusion and Major Limitations

The evidence presented in this study suggests that the adoption of the grant-in-aid system known widely as "district power equalization" in the three states of Illinois, Michigan, and Kansas in the summer of

1973 did serve to move those states toward various equity goals including the goal of fiscal neutrality, at least as those goals are operationally defined in this study. There are several limitations on this major conclusion. First, there is some evidence that very poor districts in Illinois and Michigan may not have moved as fast toward the state median expenditure as most advocates of equity criteria would have wished. Second, the evidence presented here is for only two years after the reform in all three states. It cannot be said with certainty that the longer term effects of district power equalization are as beneficial as the short term effects appear to be or that they would be greater. Third, district power equalization grants-in-aid vary greatly from state to state as the information in Chapter III clearly shows. It cannot be said with certainty that all forms of grants-in-aid fitting under the general category of "district power equalization" would have the same effects as those investigated here. Fourth, the evaluation here is in terms of the total effects of these grant-in-aid reforms. It cannot be said with certainty which parts of these complex laws produced the effects noted here. Finally, the evidence presented here relates solely to the state general purpose grant-in-aid and no evidence is presented dealing with the effects of state categorical or federal expenditures. However, with these five limitations born clearly in mind, this study should offer some degree of comfort to state legislatures that have either (a) recently adopted district power equalization systems, or (b) are not actively considering the adoption of such grant-in-aid systems.

Recommendation for Further Research

The following recommendations for additional research are suggested:

- The examination of the effect of changing tax rate distribution

on the distribution of school revenue for operating purposes in district power equalization states. As indicated in Chapter I, the distribution power equalization system has as its unique nature "reward for effort." Under this system, the major concern is how "perfect" fiscal neutrality can be achieved. Thus, future research could determine if the district power equalization system has more positive effect in stimulating moderately rich school districts to raise their tax rates than it has in stimulating the poorer school districts to raise their tax rates. If this effect is determined to be operating, then the disparity of school revenue would be shifted upward and thus move the state away from the fiscal neutrality. To move the state toward fiscal neutrality, wealthy districts should get a lower percentage of matching state revenues for local tax rate increases than do poor school districts. Thus, it is extremely important from a policy-orientation standpoint to determine the effect of district power equalization formulas on changing local tax rates.

2. The comparing and contrasting of the characteristics of school districts that passed tax referendums and of school districts which failed to pass tax referendums in financing public schools. Districts with high effort in passing tax referendums may be those having high property wealth, high income, and high levels of education. Districts which failed to pass tax referendums may be those having low property wealth, low income, low educational level and located in rural areas. If so, it suggests that the socioeconomic variables might serve an important function in determining whether or not other districts can pass their tax referendums. Thus, the optional local taxation may not serve the purpose of achieving the goal of fiscal neutrality because wealthier school districts with a higher proportions of highly educated people, for example, may tend to provide more

educational resources for their children than do poorer school districts with a lower proportion of highly educated people. Thus, determining if optional local taxation helps move the state school districts toward the goal of fiscal neutrality is of prime importance. If the optional taxation feature is counterproductive toward achieving fiscal neutrality, it should be constrained.

3. The examination of the effect of school revenue control on the distribution of school revenue in relation to district wealth. A number of states, such as Kansas, Colorado, Maine, and Wisconsin recently have specified the maximum limit of budget expansion. If districts with high property assessed valuations increase their budget more frequently and closer to the limit than do the districts with low assessed property valuation, the disparity of school revenue among rich and poor school districts tends to increase with the passage of time. In order to remedy this situation, the different budget limit may need to be specified inversely in relation to the district wealth. Thus, the relationship of district wealth to budget expansion needs further study.

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